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Railroad News.

Surveys for the Boston & Newton narrow gauge location have just been completed.

Ground was broken on the 15th inst. for the Manchester & Keene R. R. Richardson & Gallison of Boston are the contractors.

The Hartford, Providence & Fishkill R. R. have just received a new locomotive, the Gov. Lippett, from the Taunton Locomotive Works.

The Russian Government has in contemplation a railroad through Central Asia 2,000 miles in length, the estimated cost of which is $200,000,000.

Barnum, Richardson & Co. of Lime Rock, Conn., have shipped 6 tons of car wheels of various designs, and 3 tons of sectional parts of wheels, to the Philadelphia exhibition.

The articles of association of the Boston, Winthrop & Point Shiler R. R. Co. have been published. The gauge is to be three feet; distance four miles; capital stock $100,000.

The rolling stock has been increased 10 per cent. on the New York, New Haven & Hartford Railroad to meet the demands of the extra travel to Philadelphia this summer.

The Central Vermont Railroad property is insured in the London, Liverpool and Globe Insurance Co., for the sum of $2,000,000. It is said to be the largest insurance policy in New England.

There are in operation in Canada 4,483½ miles of railway, which have been constructed at a cost of $299,782,557.63. The profit on this large amount of capital is only about 1½ per cent.

The Stoningham Railroad has recently placed a new baggage car on their line, which is said to be the finest ever built. It is nearly 70 feet long, and is fitted up in as fine style as a drawing-room coach

The roadbed of the Gallipolis, McArthur and Columbus Railroad was offered at Sheriff's sale on the 29th ult., but no person bid. More than $300,000 worth of work has been performed between Karne's and Gallipolis.

The contract has been let for the construction of the Denver & Rio Grande road to the foot of the Veta Mountain, twenty-five miles from Cucaras. Messrs. Moore, Carlile & Orman are the contractors, and the work was commenced on the 10th inst.

The Railroad Commissioners of Connecticut have made their annual report for the year 1875. They report that the railroad bridge at Windsor Locks, across the Connecticut, is weak, also the Shore Line Railroad bridge at Saybrook. The foundations of the latter have spread. A diver who examined them found that the stones between the piles have been washed away.

A Sandusky special says: The prospect of immediate work here on the Wheeling & Lake Erie Narrow Gauge Railroad is good. Richie & Co., of New York and Chicago, offer to build and equip the road for $18000 per mile—$10,000 in bonds, $5000 in stock, and $3000 in local subscriptions—and agree to have the first hundred miles from Sandusky south completed January 1, 1877. The contract will probably be awarded them.

The Roane Iron Company, Chattanooga, has about half completed a contract to furnish 4500 tons of rails to the Little Rock & Fort Smith Railroad. In order to fill this and other orders, five hundred men are employed day and night. They are also doing a good deal of work for the East Tennessee, Virginia & Georgia, Memphis & Charleston, Mobile & Montgomery, Montgomery & Eufala, Western & Georgia Central railroads,

The new Centennial train from Boston to Philadelphia, via New York & New England road through Willimantic and Hartford, and the New York, New Haven & Hartford through New Haven and Harlem, thence by the new ferry boat, Maryland, to Jersey City, and Penn. Central, commenced running May 8th. Passengers do not have to change cars from the time they enter the train at Boston until Philadelphia is reached.

Narrow-Gauge Railways.

One of the most serious questions in the future of our railway system is that presented by the introduction of the narrow-gauge lines, which of late have been multiplying in different parts of the country. So long as the success of such roads seemed problematical they excited but little attention, but now that a number of lines have been in operation loug enough to prove them to be profitable experiments, the inquiry as to their influence upon the older and more expensive lines becomes interesting, and may, perhaps, be useful to all friends of internal improvement. In looking over the railway items of the day, we find in the state of Ohio some 800 miles of these narrow-gauge roads in process of construction or projected, while in Massachusetts, Pennsylvania, and several other states, some lines are in successful operation, while others are starting into life. At a rough estimate, we should say that at least 1,500 miles of these narrow-gauge roads were in various stages of progress, and most of these have been projected within the last six months. The significance of this statement of railway enterprise during a period of profound business depression, and when people have been great losers by investments in new railways of the regular 4 feet 8½ inch gauge, will be readily understood. It is something like a popular verdict in favor of the narrow-gauge system, all the more pronounced because it comes at a time when the construction of railways of the ordinary gauge had almost entirely ceased, except in the completion of lines partially built.

It is claimed that these roads of three feet gauge can be built at two-thirds of the cost of the 4 feet 8½ inch tracks, and that they can be operated at about the same proportion of expense, and this claim seems to have been established satisfactorily wherever they have been constructed. The Denver & Rio Grande road, which is to extend from Denver, Colorado, to El Paso, in Texas, a distance of 850 miles, has been in successful operation for some time, although not yet completed. The Parker & Kansas City road, in Pennsylvania, has done a large and profitable business for several years, and in Massachusetts the Revere Beach & Lynn road, from Boston to Lynn, opened in August, 1875, actually earned 8 per cent. on its capital during the first six months of its operation, without carrying a pound of freight, and this, too, in competition with the Eastern, one of the oldest lines in the state. These facts give unusual prominence to the narow-gauge question, and cause thoughtful men to look with some anxiety as to the bearing of a development which promises to increase with great rapidity. Hitherto it has been assumed by some of those whose opinions are entitled to weight, that these lines would be substantially confined to local business, and that instead of competing with the lines of the older system, they would act mainly as feeders, and thus become advantageous in the manner of small streams which flow into the broader channel of a river, and increase its current and volume; but the success of such roads as the Boston, Revere Beach & Lynn, has disturbed this theory somewhat rudely, and now two or three lines extending from Boston, ten or fifteen miles through thickly-settled districts, are in the early stages of organization, and every one of these will draw seriously from the broad-gauge roads when completed. If the statements of costs can be relied upon, and there is no reason to doubt them so far as our information goes, one of these little narrow-tracked intruders could be gradually constructed from town to town, in such a way as to injure seriously the older and more expensive lines, which it may enfold and intersect throughout its entire length.

If this seems like a real danger it is worthy the best thought which men of intelligence, familiar with the railway history of the country can bestow upon it. Can this apparent threat of inteference with established lines be turned to advantage instead of becoming an injury? We propose to make a few suggestions on this point in our next.—*Railway World.*

The New Lynde Brook Reservoir Dam.

The Worcester Press gives the following account of the plans made for the new dam at the Lynde Brook reservoir by the Hon. William J. McAlpine of Albany: "In the first place the engineer stoutly protests against the use of flash boards, If there be likely to be at times a large amount of water which it is of importance to save for use, he says that the dam should be built with reference to it, allowing a larger sum of money than now appropriated to be expended. He proposes, however, having once constructed a dam to hold a certain volume of water, never to attempt to save more water by putting on the so often fatal flash boards. Another very excellent arrangement of Mr. McAlpine's is never to allow the water in the reservoir to rise higher than a point three feet below the top of the embankment. In case the roll-way and tne gates should not be sufficient to keep the water in the reservoir at this established level the gate house will be constructed with special reference to securing this desirable object. The gate house, in accordance with Mr. McAlpine's plan, is also to be essentially different from the old gate house. It is to have three gates on one side, situated at different depths in the water, thus allowing the drawing of water from the lower strata of the reservoir at those seasons of the year when decaying vegetable matter is floating near the surface of the water and fouling it. These gates open into a hollow tower, from the bottom of which the supply and waste pipes are conducted. The top of this tower is to be entirely open above the determined level of safety, and thus a spill-way in addition to roll-way and gates is furnished. The surface water which flows over the top of the tower falls into a receptacle from which the waste pipes open, and thus will not mix with the purer water being drawn for use from a lower depth in the reservoir. Mr. McAlpine considers the proper arrangement of the pipes a very important matter, and proposes to prevent, as far as possible, the dangerous tendency of the water to follow the structure of the dam. For this purpose it is proposed to construct the pipes with projecting collars at convenient points to break the flow of water along them. The pipes are also to be as closely as possible imbedded in a securely built wall of masonry. In the construction of the puddling wall through the center of the embankment great care will be taken. Mr. McAlpine is confident that according to his plans, carefully carried out in their details, a dam to stand for ages will be built up.

STREET PAVEMENTS.

(CONTINUED.)

(From the St. Louis Republican.)

These blocks were laid in a bedding of broken stone and sand. The interstices were filled with sand and pitch, and the top then covered with sand. (Civil Engineers' and Architects' Journal, vol. 3, p. 67.)

Then there was a plan in which the blocks were squared; another in which they were grooved and dove-tailed into each other, and another in which the edges of the blocks were chamfered off to give a better footing for the horses, and so on through variations too numerous to mention.

But the hexagonal was the most popular form and indeed the best.

This kind of pavement was a vast improvement over the plank road. It was smooth, hard, noiseless and clean. The blocks withstood the wear of the traffic in a remarkable manner for a time, as well, if not better even, than granite. The highest hopes were entertained of it, and it very rapidly became the popular pavement. It was introduced into London in 1838, being first laid as an experiment in Oxford Street. This experiment succeeded so well that wood paving companies were formed through whose agency its use was rapidly extended. In 1843 we find it already laid on two of the great thoroughfares for a distance of over two miles each (namely from the Mansion house westward on Oxford St, nearly to Regent St., and on the Strand nearly to Westminister bridge,) as well as on many less prominent streets. (Engineers' and Architects' Journal, vol. 5, 1833, p. 280) Several books were published to set forth its merits, and Mr. Hope, a civil engineer, in a paper before the Royal Scottish Society of Arts in March, 1843, takes the high ground that wood paving is not only smoother and better for the horse, but that it "is more durable than granite." (See "Practical Mechanics' and Architects' Journal," vol. 3, 1843, p. 33.)

The Civil Engineers' and Architects' Journal (see as above) sums up the case in behalf of wood pavements in a somewhat enthusiastic article in which we are told that old prejudices on this subject are fast melting away. Contrary to old opinions, wood when damp, as in pavements, is one of the most durable of substances. Wood paving, when properly laid, does away with noise, lessens the wear of the vehicle, diminishes the traction, and saves the horses. And on this latter head we are told, of the evident pleasure with which these faithful creatures come upon the new pavements. After this we are not surprised to learn that in the parish of Marylebone there is a society headed by a gentleman of fortune, whose object is to extend the use of wood-paving as a sort of missionary work,

Two years later, in 1845, seven years after the introduction of wood pavements, when their inevitable decay had set in, we begin to hear the notes of a new song. The same journal just quoted in introducing a description of "Dockins' Hemitropic Wood Pavement," the latest patent of this kind, remarks that at present all wood pavements are objectionable. They fail for various reasons; sometimes it is because of the swelling of the wood; sometimes it is for want of drainage, which induces speedy rot. "The wood," the writer continues, "is chosen for its cheapness, not its durability." The fibres are beaten down by heavy teams, and in wet weather such pavements "are dangerous to man and beast." Cleanliness would help the matter if it could be attained, but the true solution is brought by Dockins with his hemitropic pavement, which is formed of a kind of modified hexagonal blocks, chamfered round the edges so as to give the pavement a rougher surface. But somehow Dockins and his hemitropes disappear without bringing any relief, and Oxford Street and the the rest, with a few trifling exceptions where quiet was more essential, are clad again in their cast-off coats of granite.

Whilst this was going on in London an experience of the same sort was had in this country, Wood pavements of all the approved forms, including the hexagonal, were laid in New York, Boston and Philadelphia. The result of this experiment in the latter city, which is the same as in the other two, is given in a report made in 1843 by a committee of the Franklin Institute to whom, at the request of the city authorities, had been referred the whole matter of street paving. They report that all forms of wood paving are expensive in first cost and that none yet tried in Philadelphia has lasted over four years. One piece of hemlock paving had to be renewed within three years, and another piece, which had been treated by Earle's patent preserving process, was already much decayed although just laid down. And they conclude that until some better process of prolonging the life of the wood shall be found, it must, on the score of economy, be given up as a material for pavements. (Franklin Institute Journal, vol. 32, p. 158.)

After this wood pavements go out of use, and for several years we hear of them no more.

NICOLSON PAVEMENT.

But the genius of wood-paving was to have a new avatar. In 1855 Samuel Nicolson writes to the *Civil Engineers' and Architects' Journal* of London, and states that for thirty years he has been treasurer and superintendent of the corporation owning the Mill-dam, one of the principal roads out of the city of Boston; that the difficulties of maintaining this road had suggested to him a new style of wood-paving, of which he caused trial samples to be laid on the said Mill-dam in July, 1848; that these having been successful, other pieces of it had been laid in Boston with like good results. Having thus received the favorable verdict of experience, he now feels justified in offering his new pavement to the public of the Old World as well as the new, as of all pavements yet found the best in point of safety, noislessness, cleanliness, healthfulness, durability and economy. In miasmatic cities he thinks the coal tar which he uses will be a valuable antidote to malaria.

This pavement, now so familiar to you all, consists, first, of a flooring of plank from one to two inches thick laid lengthwise of the street. Upon this are laid rectangular blocks of wood, about four inches wide and six to eight inches deep, laid in rows at right angles to the street, the different rows being kept apart by strips of wood three-fourths of an inch wide and three or four inches deep. The spaces thus left are filled with coal tar and gravel rammed in and the top surface then covered with gravel. It differs from former pavements in the plank flooring, which secures greater evenness of surface, and in the space betwcen the blocks whereby the horses get a better foothold than in the older forms. That in this latter respect it was a great advance upon the older forms, which were very slippery in wet weather there can be no doubt, and as it is sufficiently hard and smooth and very noisless, it is, whilst in good order, an almost perfect pavement.

It is hard to imagine anything better. It is so very good that people were easily persuaded, as in the former trial of wood pavements, that it would be also durable. As a consequence its use extended very rapidly. Introduced into Chicago in 1856, it soon became the standard pavement. In Cleveland, Detroit, and Toledo, it became equally popular. In Washington, under the district ring, about $2,000,000 were spent in this pavement, most of it being treated by some patent preserving process. In St. Louis the first piece of it was laid in 1860 and although it never became with us the rage it did in other cities, yet there are to-day over ten miles of it on our streets.

The result of these trials is nowise different from what we should expect. The wood being only wood, lasts about as long in the pavement as it does in a railroad tie or in a bridge, but no longer. Under favorable circumstances the pavement will be good and sound for four or possibly five years. By that time decay sets in and in from six to eight years the pavement is wholly gone. During this period of decay it is very rough and thoroughly bad. It also becomes unclean and injurious to health. I cannot better set forth this phase of wood pavements than by quoting from a report of a committee of the board of health of Washington. The committee find: "That probably four-fifths of the newly paved streets of our city are paved with wood, varying in kind, some having been treated with antiseptics before being laid. That within three years from the time they were laid every one of them gave more or less evidence of very rapid decomposition and some of them have decayed so rapidly as to give rise to a mass of dangerous putrefaction. That moreover the broken surface of the pavements above mentioned has allowed the lodgement of an immense quantity of animal and vegetable filth impossible even to calculate, between and under the blocks of wood, not only greatly increasing the putrifying mass, but adding to rapidity of its decomposition. That from said decomposition, gases arise, fungi and infusoria develope, which, entering the air we breathe, are poisonous, engendering zymotic diseases, such as typhoid, malarial and intermittent fever, dysentery, diphtheria, &c." And the committee pray that so soon as the wood pavements give evidence of general decomposition they be removed. This report is endorsed by the city engineer, who says further that the only way to repair them is to get rid of them.

In St. Louis our experience has not been as disastrous as that in Washington. In most cases we have got the full life of the wood—six or seven years—which has not been shortened by any so-called preserving process. In some locations, as on Main Street, the wood is worn out before the time of decay. In other cases we have doubtless let them remain too long, until they become dangerous to the public health, for probably no wood pavement should ever be allowed to remain down longer than five years.

But with this life time the Nicolson pavement becomes very expensive, costing from 50 to 100 per cent. more per annum than a pavement of granite block. Of other forms of wood pavement which have been invented since the Nicolson, it is not necessary to speak, as they do not differ essentially from the Nicolson and are not less expensive.

But to sum up the whole matter—though in special cases where quiet is essential, as near churches or hospitals, the use of wood may be justified, notwithstanding its great cost—we must on the whole reiterate the verdict of the Franklin Institute in 1843; that for common use wood paving in any of its forms cannot be recommended.

ASPHALT PAVEMENTS.

I come now to another class of pavements in which the materials used are of a more durable kind, and which a large number of persons, including many engineers, think to be the true pavement of the future—I mean the class of asphalt pavements.

Of these there are two kinds, often confounded, but which should be kept very carefully distinct. They are the natural rock asphalt and the artificial asphalt or, as they are more properly termed, bituminous concrete.

The natural rock asphalt is a limestone containing about 10 per cent. of bitumen or natural pitch. It is believed that this rock was once saturated with petroleum, from which in the course of ages the volatile parts have passed off leaving behind the heavier and stabler parts in the form of pitch. This pitch is diffused through the whole mass of the limestone and incorporated with it so closely as to be inseparable except by the appliances of the laboratory. Ordinary atmospheric influences do not affect it.

This rock is found in several places in Europe, but only two furnish a product that is useful for street improvements, the rest containing either too much or too little bitumen for the purpose.

These are Val de Travers, near Neuchatel, and Seyasel, on the Rhone, about 50 miles south of Geneva, both being in the Jura range of mountains and near the boundary between France and Switzerland. No bed of it has ever yet been found in America.

Its use for street pavements dates from 1854, when, after many experiments, the present plan of using it was first discovered by a Swiss engineer. This plan is, first to reduce the stone to a powder. The road-bed is then covered with a bed of ordinary concrete 6 to 9 inches deep. On this a layer of the powdered asphalt 2 or 3 inches deep is spread in a heated state, and is then, whilst cooling, consolidated by heavy rollers. By this means it is soon rendered almost as hard as in its original state, with a smooth, clean surface, without joints and wholly impervious to water. As it presents no edge for abrasion it wears very slowly. Exactly how long it lasts is not certain, from the fact that it cannot be allowed to wear out, but must be repaired at once whenever the surface is broken. In this way the whole is in course of time renewed.

Mr. Haywood, city engineer of London, puts the time required in Paris for complete removal of the surface at from six to ten years.

Asphalt is the cleanest and most healthful of all known pavements. The little dust that is found on it is very easily removed, either by washing or sweeping. In London the asphalt is never watered except to clean it. It is also very quiet, although less so than wood, which, in this respect, takes precedence of all other pavements.

The objections to asphalt are, first, its cost, which in London is over $50 per 100 square feet, and with us would probably be so much more as to put it out of reach; and, second, and most of all its too great smoothness. This is so great that in England it is used for skating rinks.

The absence of all joints prevents the horse from getting a firm foothold at any time, and when it becomes wet it becomes so slippery as to be dangerous both to horses and footmen. In July, 1873, the owners of 15,000 horses petitioned the city authorities of London to discontinue the use of asphalt in that city, alleging that their horses were quickly deteriorated by travelling over it, and that the accidents to them had increased fifty per cent. since its introduction, and a very careful investigation made subsequently by the city engineer showed that the petition was not without good grounds. In Manchester an experimental piece of it was taken up for this reason.

[TO BE CONTINUED.]

Brazilian Projects.

The London Investor's Guardian says: The Emperor of Brazil has reasons of importance for his approaching visit to England. About two years since his majesty consulted Sir John Hawkshaw as to the practicability and possible advantages of a line of railway through Brazil, towards Uruguay and the Riverine of Paraguay, which would largely extend the internal trade and develop the land resources of Brazil. Our great engineer—the greatest certainly of his day—went over to Brazil and made a personal inspection of the country. He finally came to the conclusion that his majesty would be justified in pledging the revenue of Brazil to the extent of a guarantee of 7 per cent. interest on the intended system. The operation will be a large one, and it is for the purpose of consulting and arranging with the leading capitalists of Europe, and especially of England, that the present journey of the emperor has been undertaken. The enlightened sovereign of Brazil stands far in advance of all the monarchs of his age in matters not only of practical science, but of that especial statesmanship which devotes itself, above all things, to the education, industry, and future prosperity of the nation, the administration of which has been entrusted to him. As such he deserves the warm welcome we doubt not he will receive from the people of England.

Brazil has always stood high in credit, pre-eminent indeed, among the South American States; towards which, indeed, in their factious disorganization, she stands as does Russia to Central Asia.

The Moxahala tunnel, on the Atlantic & Lake Erie Railway, is 920 feet through solid rock. The approaches are about 3500 feet in length, mostly all rock.

Tidal Drainage.

A paper read at the Annual Meeting of the Boston Society of Civil Engineers, by Clemens Herschel, C. E.

I have made the surveys and estimates for two schemes of tidal drainage, and have built a third. The results of these three are as follows:

Name of the river.	Drained area in acres.	Reservoir in acres.	1 Acre reserv. for acres dr. area.	Sluice cross-sec. square feet	Useful or working sluice cross-sec. square feet.	Acres of dr. area for every sq. ft. of max. useful st. sec.	Range in ft. of inside water.
Green Harbor River	4600	200	23	30	15.-20	230	1
South River	10400	46	226	60	50.-60	173	3.5
North River	55800	815	68.5	232	95.-119	470	1.3

Waring says, that in Holland, where they drain by steam, Reservoir = .05 drained area.

These results are evidently of a character that forbids the drawing from them of rules for new cases. In point of fact, it is the decided conclusion to which the writer has come, and one that is at variance with the attempts of some writers on the subject, that the formation of rules for a matter of hydraulics in which there are so many variables as in this of tidal drainage, is impracticable; each case must be examined and decided by itself. The variables are:

1st. The rise and fall of tides.

2d. The area of the inside reservoir.

3d. The maximum cubic feet per second that the reservoir will be called upon to store up.

4th. The position of the sluice bottom with reference to low water mark in the river or bay just outside of the sluices.

5th. The area of these sluices, in cross section.

Upon these it may be said:

1st. The less the range of the tide, the more difficulty to establish an effectual drainage. Tidal drainage in Massachusetts Bay is easier accomplished than along the Sound; with only 3 or 4 ft, of tide, pumping will, as a general thing, have to be resorted to.

2d. Other things being equal, which is a familiar way of saying, as they do in the differential calculus, "assuming now x to vary, while $y + z$ remain constant," all else remaining the same, then, the larger the area of the reservoir, the greater may be the maximum inflow, with the same sluice cross section, without exceeding a certain inside range of the water, or the smaller may be the sluice cross section, with the same maximum inflow without exceeding a certain inside range. Roughly speaking, the area of the reservoir and the maximum inflow in 6 hours, determine the range of the water upon the inside, and the position and size or number and size of the sluices must be such as to restore, during the next 6 hours, the reservoir capacity that the 6 hours of the flood have been instrumental in destroying. If this is done, then the maximum inflow during the 6 hours of the ebb, will need little or no additional sluice cross-sections, speaking generally and roughly. The diagrams of the South and and of the North river sluices will illustrate this. The South river case was described in the *Journal of the Franklin Institute*, Aug. and Sept., 1871.

In the design for the North river drainage works, the velocity of the negative wave going up stream, upon the opening of the gates, and of the positive wave going up stream, upon the closing of the gates, was taken into account. The river is about 12 miles long in that part of it which comprises the reservoir area.

In applying the foregoing remarks to the subject of the last meeting, the sewerage of Boston, they naturally have a different bearing according as we consider the sewers of Boston, as they are, or as they are to be, when completed as recommended in city doc. No. 3. Again, the subject is a different one, according as a proposition is made for some betterment only, or as the aim is a radical change.

The writer has never, and does not now wish to suggest much more than would come under this last head of some proposed improvements; a thorough examination of the plan proposed in the report of the Sewerage Commissioners, or an entirely new scheme of sewerage, would both require an amount of time and study properly to prepare, that cannot be given to the subject without making a regular business of it. In speaking of the sewerage report, it is easy enough, also, to distinguish between the report of the Engineers, and that of the medical gentlemen interested in the subject. In the medical part of city doc. No. 3, and in many reports of the State and City Boards of Health, there has been great complaint made of the infiltration of salt water into the soil of various parts of the city; that the tide ebbed and flowed under many streets, where it would not ordinarily be expected; that the level of the ground water was too high, (and an engineer must conclude, that if the statements first made are facts, that they must in themselves have a material effect in raising the level of the ground water); and that this high level of the ground water was a cause of various diseases. With these statements on the part of the health authorities, and reiterated so often, it would seem to be worthy of note, that after all, in the report of the Sewerage Commission, no remedy has been suggested for the alleged evil They propose tight sewers, which of course can have no effect on the level of the ground water; and if the sewers be supposed permeable, then if it is true, that the tide ebbs and flows under so many streets of Boston, it becomes a serious matter to keep the waters of Boston Harbor out of the sewers, beside which the sewers will not have affected the level of the ground water, in that event, lest haply they can contend against the Atlantic Ocean. In taking up this seeming omission in the report, the proposition of the writer has been and is, simply to stop this alleged ebbing and flowing of the tide under our streets, by boxing in all Boston, and then, to reduce the ground water level, to provide an ample quantity, or cross-section, of self acting tide-gates. If this is to be done now, the sewers themselves will pass through the line of boxing and must be provided with tide-gates. In proposing this much, it is not necessary to go into considerations of required reservoir area, or of sluice cross-section, for in any event the reservoir area, *after* the proposed work has been accomplished will have been increased, and not diminished, and the providing of ample sluice area can offer no difficulty. If no more will have been accomplished, the city will at least have got rid of being under-flowed, if that is a proper word, by salt water with every tide; wherever the nature of the filling is such that the tide ebbs and flows in it, as for instance when old hollow wharves under Broad St., oyster filling, and similar things are spoken of, there also the water can flow out, just as easy as it can flow in with the tide, and in fact does flow out now, on every ebb, or is reported to, at all events. And in such a locality the ground water will be materially lowered by boxing, and by self-acting tide-gates.

The writer can make no statement as to the amount of tidal ebb and flow under the streets of Boston, never having made any observations to that end; but if the greater part, only, of what has been said on that point be correct, it is the judgment of the writer that a district like the old cove, or the South cove, would offer enough reservoir area, concealed and under the paving, and could be drained, by self-acting tidal drainage, down to grade 2 at the sluice outlets if desired. If the statements as to the tidal ebb and flow have been exaggerated, then the efficiency of the proposed tidal drainage if built, would be less, but at the same time the necessity of it will not be so apparent. If no salt water flows in, there is no excessive ground water to be got rid of. In short, wherever the alleged evil exists, there the proposed remedy will apply, and wherever the supposed evil does not exist, a remedy is not called for, and none is proposed. A case in point is the South End, spoken of by Mr. Bradley, at our last meeting, as having already a system of boxing and of tidal drainage "in all its perfection." Perhaps this was not meant to be taken in the exact sense of those words, for perfection is a difficult thing to attain, in this world at least. And as any boxing out from the sea that the South End may possess, is the work of accident instead of design, it is probably defective in places. But by whatever amount of dyking out from the sea, and of tidal drainage, that the South End has, by just that amount is that locality better off than the reputed condition of the South Cove and the North Cove. And replying to a query as to the sufficiency of an estimate that the writer has given in a communication to the *Boston Daily Advertiser*, of $350,000, to $500,000, for the work proposed as above, his judgment is, that if no more is undertaken than to box in various districts of Boston from the action of the tide, and to make sluices, with self-acting tide-gates at the points where formerly the tide flowed in under the land, then some $63,000 per mile will be sufficient; the portions that need no boxing paying for the sluices, and in this way the whole city could be boxed in for less than a half-million dollars, the South Cove alone for 30 odd thousand dollars, etc.

As an aid to a certain defined sewerage system, the shutting out of the tide is of course just as important to the new proposed sewerage system, as it is to the present sewers, and it will not be necessary to enlarge upon this part of the subject. The proposed sewer system provides .25 inch of rain per 24 hours; the query rises what is to become of the other 3 or 4 inches of rain that sometimes falls in 24 hours; the ready answer is: storm water overflows. But these can only lead to old sewer outlets, and are tide-locked for say 12 of the 24 hours of the day. Again, what becomes of the rainfall now? what becomes of the rainfall over and above .25 inch per 24 hours in London where the storm water overflows are tide-locked part of the time, just as they will be here?

The answer seems to be, that the sewers must provide storage room for these rainstorms just as they would in case of tidal drainage. But this would bring us back to consider whether tidal drainage will not be feasible in cities, that are not built on ebb wharves, and are not filled in with oyster shells, etc. A rough calculation will be like this: one-third of the area of the city is said to be in the streets; take as the storage room afforded by the sewers an average of one-sixth the width of the street in only one-half the streets, and this storage only 3 feet deep.

This provides for $\frac{1}{2} \times \frac{1}{3} \times \frac{1}{6} \times 3 = \frac{1}{12}$ = one inch of rain over the whole territory under consideration. Two experiments made in London showed that in a territory with steep, paved streets, densely built upon, slate roofed houses, of a rainfall of about 3 inches, only 49.5 per cent. reached the sewers during the continuance of the rain.

In a territory with streets paved, but less steep, densely built upon, slate roofed houses, of the same rainstorm, only 52 per cent. reached the sewers. Boston streets are mostly, what would be ranked as streets that are not steep, and reckoning on half the rain-fall reaching the sewers, a fall of two inches in any 6 hours would be provided for by the storage area above described; it being supposed at the same time, that, as stated at the beginning of this article, there is provided a sufficient quantity of sewer outlet, in cross-section and in proper position, which can always be done. Is an allowance of two inches of rain in any 6 hours enough? if not, the reservoir area must be made larger, or else filled deeper than 8 feet, in extreme rainstorms. In answering this question of the maximum amount of rain-fall in 6 hours it must be considered that it is a question of the maximum amount on an area of several hundred acres, and that extraordinarily heavy rates of rain-fall, do not last a long time in any one spot, so that though a rain-fall of 2 inches in an hour may be registered sometimes, that we have no evidence as yet, of a rain-fall of 2 inches in an hour on 4 or 5 hundred acres. Turning to the storage room that has been spoken of, an average width of street of 36 feet, would give sewers 6 feet wide and 3 feet high above the flow line taken up by sewerage alone, in half the streets; if the streets are on the average wider than 36 feet when they occupy one-third of the whole area, it will slightly increase this sewer width. Taken altogether, it would result that it requires an average width of sewer of from 3 to 3.5 feet in all the streets, or wider than this in the lower streets and less than this in the higher ones, to store a rain fall of 2 inches in any 6 hours, and not raise the water more than 3 feet in the sewers. Have we this average sewer width now? If not, then it must follow, that either the sewers fill up more than 3 feet in the heaviest rains, or else that we have no rains exceeding 2 in. in 6 hours over area equal to those of our sewerage districts. The writer confesses to speaking on this matter of requisite storage area, for rain water in our sewers, in not a conclusive manner; it seems to be one worthy of attention, however, and also seems to be a subject that has generally been somewhat neglected in drainage schemes for cities that have tide locked sewers.

But the final answer of judgment and experience cannot vary widely under these conditions from the figures that have been given above; an *average* width of sewer of 3 to 3.5 feet, if they are not to be filled more than 3 feet deep, above the dry weather flow line, and these are not impracticable figures; they would result in keeping the level of the water at the sewer outlets between grades 2 and grades 5, by tidal drainage alone, sufficient outlet area being provided; a result that must be ranked as a tolerably good one. A *radical* change in the management of, and an improved system for the lowering of the ground water of this and other cities, the writer is not at this time prepared to submit to the Society; if it is as important to the health of cities as it is sometimes represented to be, it would seem to be a subject well worthy the attention of engineering study.

ENGINEERING NEWS.

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THE INSPECTION OF STEAM BOILERS.

Now that Mayor Hoyne and the Common Council are detaching the numerous barnacles that so long have been fattening on our city government, we would suggest the abolition of the office of City Inspector of Steam Boilers, as being not only a useless expense but in some respects an actual source of danger to the community through the imperfect inspection of boilers that it encourages. As a political appointment, it is generally given for political services rendered, rather than for a reputation for thorough scientific and practical acquaintance with the leading principles in connection with the use of steam, the construction of boilers and their management, and the means to be adopted for the prevention of explosions, posessed by the successful appointee. We do not know the present City Inspector, nor what his qualifications for the office are, but we are led to infer from the following petition of the steam users of this city that something more than his inspection is desirable:

At the session of the Common Council, last Monday night, the following, signed by a number of steam using citizens, was presented by Ald. Kirk, and referred to the Committee on Judiciary:

To the Honorable Board of Aldermen of the City of Chicago:

WHEREAS, An ordinance is in force in this city requiring that steam boilers within its limits shall be annually inspected by the City Inspector; and

WHEREAS, There are companies in this country organized for the purpose of making guaranteed periodical inspections of steam boilers, on the plan of English companies, which have been eminently successful in preventing boiler explosions;

Now, therefore, we, the undersigned steam users in the city of Chicago ask for the passage by your honorable body of the following, or its equivalent:

That steam users, manufacturers, and corporations possessing the guaranteed certificates unrevoked and in full life of any company organized for the purpose of making guaranteed steam boiler inspections, and which has complied with the insurance laws of the state of Illinois, having filed a statement of its financial condition and paid license fees and taxes, shall be exempt from any further inspection, and from the pains and penalties of the above named ordinance.

There were a large number of signatures to the petition.

The frightful results in loss of life and destruction of property which usually follow the explosion of steam boilers, and the frequent occurrence of them, consequent upon ignorance in construction and incapacity in management, many years ago led the most intelligent of steam users in England to adopt stringent rules for the prevention of these lamentable accidents, At the suggestion of Sir William Fairbairn, who is the recognized leading authority in everything pertaining to this subject, an Association of the steam users of the Manchester district was formed January 3d, 1855, which has been maintained ever since, and is to-day, perhaps the best known and most influential society of its class in the world. The Association is managed by a Committee and a General Inspector "and its primary object is to secure the greatest practical safety in the raising and use of steam, by means of an intelligent supervision, to be carried on by competent and well-instructed inspectors, employed by the Association; but in addition to this inspection for the purpose of safety, the rules provide for a *permissive* supervision of furnaces, and for a record, *with the consent of the owners*, of the duty performed by the steam-engines, and the amount of the fuel consumed, with a view to securing a more perfect combustion and greater economy in fuel. And this supervision is extended to the establishments of all the members who do not object to this branch of the Association's operations.

"The principal object contemplated by the formation of this Association is, however, the increased security against *explosions*, which a periodical inspection by an experienced engineer affords, and the saving of fuel which may be expected from the inspection of an intelligent officer well acquainted with the principles on which perfect combustion depends, and with the most successful modes of applying those principles in practice; to which may be added, the removal of any pretence or necessity for Government inspection."

In lieu of these associations, in this country there are organized corporations similar to insurance companies, which make a business of inspecting steam boilers and insuring them against explosion. These companies necessarily employ intelligent and capable engineers to travel for them and inspect the boilers of parties wishing to be insured, and it is doubtless owing to the periodical examinations made by these men, rather than to official inspection that we have so few boiler explosions. Recognizing this fact, and considering the official inspection as being unnecessary, and even burdensome upon them, the steam users of Chicago who have paid for the benefits of the more scientific and valuable inspection of the Insurance Company present the petition as above. In connection therewith we solicit from steam users, correspondence on the subject of official inspection, and also the extent of the benefit arising from the inspection by the Insurance Companies, and whether it is not time for the formation of associations for purposes similar to those of the English societies. ENGINEERING NEWS is now read by a considerable number of the leading manufacturers of the country, and its columns are ever open for information on the great subject of modern times —Steam Engineering.

WE NOTICE that the article on the "Nautrigon," from No. 17 of the NEWS, is reprinted in the *Franklin Institute Journal* for May.

A PETITION bearing nearly eight thousand signatures of the largest tax-payers of Boston was recently presented to the City Council, praying for immediate action in favor of the proposed public parks, on the grounds of 1st sanitary needs, 2r, a favorable time to purchase, when real estate is depressed, and 3d, the giving employment to laborers.

FOLLOWING close upon our recent notice of the various projects for tunneling the Detroit river, although having no connection with it so far as we know, it is now reported that Gen'l Sooy Smith, the well-known engineer, has offered to furnish plans for a tunnel, and, if approved, to build it before calling for pay, provided he could have the right to use it to his profit until it is paid for. We get this information from a letter submitted to the Mayor of Detroit on the 20th inst.

Local Intelligence.

It is not probable that the present Common Council will authorize the construction of many sewers this year.

Mayor Hoyne and the new Common Council of this city made a good start on Monday night last towards cleaning the Augean stable of official corruption with which the city has so long been accursed. Dr. Ben. C. Millar and forty-five of the employes of the Board of Health were relieved of their arduous and odorous duties, and the supervison of the sanitary condition of the city was placed under the superintendency of Dr. B. Mc Vickar, the president of the late Board, assisted by a special committee to be appointed by the Common Council. Then followed the official decapitation of Mike Bailey, building inspector, and his twelve assistants, and the complete abolition of the useless and expensive Department of Buildings, and the duties hitherto pertaining to this office were relegated to the Board of Public Works. Mayor Hoyne also considered that the best interest of the city required the removal of Comptroller Hayes, and the appointment of R. P. Derrickson to fill the vacancy thus occasioned; he also very wisely concluded that Chicago did not need the services of a City Marshall, and accordingly he relieved the city of the maintainance of that purely ornamental officer and recommended the discontinuance of the office itself, in all of which the Common Council agreed almost unanimously with him, and acted accordingly. There are a few hundred more useless appendages to the city government, and we expect to see a very decided thinning out in the ranks from week to week as they are discovered by the long suffering tax payers at whose expense they have been living for years past.

D. C CREGIER.

Ald. Aldrich presented the following, which was referred to the Committee on Fire and Water:

WHEREAS, The Board of Public Works has removed D. C. Cregier from the position of Chief Engineer of the Pumping Department of the city of Chicago without good cause; and

WHEREAS, Mr. Cregier has been proven by twenty-three years' continuous service in this position to be a gentleman whose integrity, industry, and ability cannot be questioned; and

WHEREAS, We recognize the fact that the position heretofore so ably filled by Mr. Cregier is one of the most vital importance to the city of Chicago, regardless of race, color, or political views; now

Therefore, We, the undersigned citizens and tax payers of Chicago, petition the Honorable Board of Aldermen of the city of Chicago, that it direct the Board of Public Works to reinstate D. C. Cregier as Chief Engineer of the Pumping Works of the city of Chicago.

C. M. Henderson & Co., C. P. Kellogg & Co., J. L. Hancock, J. V. Farwell & Co., H. W. King & Co., and 200 others.

The New Water Works at Taunton, Mass.

The preliminary arrangements for the construction of the new water works at Taunton, Mass., are all made and the work is to be commenced at once. Our correspondent writes:

"Messrs. Perrin, Rhodes & Harris. water commissioners of the city, have taken about five acres of land on the bank of Taunton River, for the location of a filter bed and pumping machinery for the new water works. The filter basin or reservoir is to be made 360 feet long and 17 feet wide on the bottom, with banks sloping two to one. It is located near the river and the earth being gravel forms a natural filter. The contract for all the pumping apparatus, machinery, filter bed, boiler and pumping stations, and river connection has been awarded to the Holly Manufacturing Co., of Lockport, N. Y., for $62,000. The contract for all the main and distributing pipes, hydrants connections, etc., and the laying of the same has been given to R. D. Wood & Co., of Philadelphia, for $124,750. There will be seventeen miles of pipe. The work is to be finished by October 1st, next George H. Bishop, C. E., is engineer in charge of the construction of the new works, and J. F. Montgomery, C. E., of Taunton, his assistant. The latter gentleman is at present actively engaged upon the field work. his chief associates being Chas. B. Caswell, C. E., and Geo A. King, C. E., both of Taunton."

Correspondence.

NORWALK, O., May 10, 1876.

EDITOR NEWS,—I submit the following problem for the consideration of your readers:

B. bought of A. 16 acres, in 1860, bounded and described as follows: Beginning at the N. E. corner of A's land, thence west along his north line 160 rods to Jones' east line, thence south 16 rods, thence east, parallel to A's north line, to the center of the road. Thence north 16 rods to the beginning, containing 16 acres.

By actual measurement the north line of A's land was found to be 38.22 ch. What should be the width of the land sold to B.? An answer in your paper would oblige.

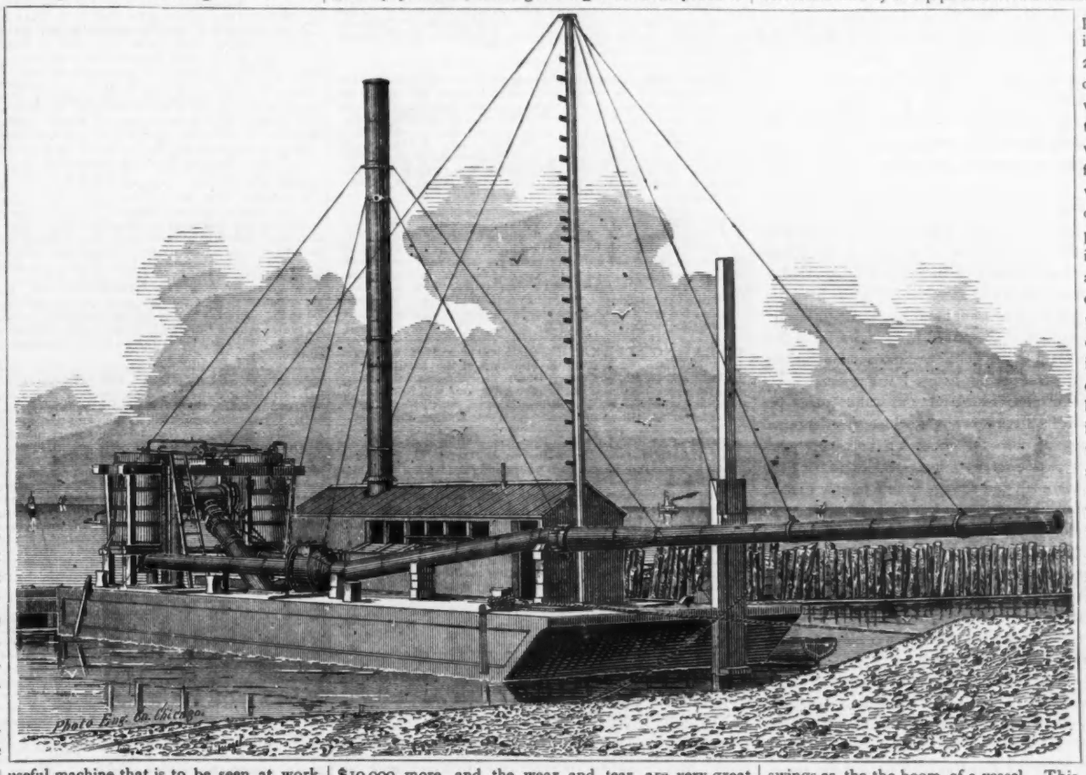
C. M. WILCOX, Huron Co. Surveyor.

The gas bill of the Boston post office for last month amounted to $11,000.

DREDGES AND DREDGING.

To the Dutch people is generally awarded the merit of the introduction of the Dredge as a means of excavating materials under water, raising them to the surface, and depositing them on an adjacent bank, or on barges for removal to a distance. The necessity of employing some method for cleaning their numerous canals by which the internal traffic of their country was carried on, no doubt suggested the first rude machine, which is termed the "bag and spoon" dredge, and which was simply a strong leather bag attached to a ring of iron about two feet in diameter and fixed to a long pole, by means of which the bag was lowered by the side of a scow, and guided by hand while being drawn along the bottom by a rope attached to a windlass placed on another barge, until it was raised to the level of the receiving barge and emptied. This system, though slow, has been very largely used in Holland and England even up to the present time, in narrow canals where the water was shallow and the bottom soft, and where a steam dredge could not be used to advantage.

Another early method was to drag a large iron spoon-shaped shovel along the bottom to be excavated, by means of ropes slung between two barges moored at at some distance apart, and on one of which was a crab-winch by means of which the spoon was hauled along the bottom and up an inclined plane to the deck of the barge, where it was emptied, when it was drawn back by means of a windlass on the other barge.



In 1796, or thereabouts, Messrs Boulton and Watt built the first steam dredge which since then has received numerous improvements, and has become the powerful and useful machine that is to be seen at work wherever river or harbor improvements are in progress.

Dredges of the present day are of the kind known as the "Elevator" or endless chain, the "Dipper" dredge, the "Clam shell" and the "Pneumatic".

The Elevator dredges are generally large, massive, strong and costly, and frequently are arranged with propelling power, and a well or pocket for the reception of the excavated materials. When this is filled, the vessel is moved to the dumping ground and unloaded, when it returns to the ground for another load. These dredges are very effective in pure sand, mud or clay, but are very liable to accident and delay when the bottom is mixed with snags, boulders, or other obstructions. They are arranged so as to cover quite a wide cut at once, but they are regarded as quite complicated and are but little used in this country. Their capacity is from 400 yards to 4000 yards per day, according to size, power, and the facilities for getting rid of excavations.

The "Dipper" dredges are the most universally used in this country. The dipper is from 1 to 3 cubic yards capacity and is attached to a timber called a handle and is worked from a crane at one end of the boat. They are arranged for working in about 15 to 20 feet of water, on the lakes, while on the coast about 33 feet depth is generally required. They are strong, have powerful machinery and cut their way through almost any kind of soil with equal facility and in almost any direction. Some are arranged with a high and long crane for purposes of making an embankment on the shore or for filling behind some prepared dock; but generally the crane is short, with swing and hoist sufficient to work comfortably over a dumping scow, which, with a tug boat, are necessary adjuncts. In ordinary material the capacity of these dredges is from 500 to 1000 cubic yards per day.

The "Clam shell" dredges are adapted for soft muddy bottoms. They are built larger and with heavier machinery than is generally put in the dipper dredges, and work in shallow or deep water with equal facility. Their capacity is from 800 to 2400 yards per day in material adapted to them. There are but few in use away from the coast.

Of the dipper dredges there are two kinds, known as the "Osgood" and "Otis" patents. Both, to the unitiated, appear alike. The "Otis" has an attachment on the crane by which the dipper can be thrust forward into the soil, thereby gaining some advantage in hard bottoms, but the performance of each is nearly similar.

The cost of a good dredge is about $20,000, scows about $2500 each, and a good tug boat aboat $8000 to $10,000 more, and the wear and tear are very great in a season's hard work.

The application of the pneumatic system is one of the latest improvements in dredges, and on page 136 of *Engineering* for February 18th, 1876, there is a somewhat detailed description of the most recent, and apparently the most effective, of English inventions in this line. The machine there described was constructed for the Millwall Dock Co., under the patent of Mr. F. E. Duckham, the engineer of the company, and the use of the air pump is confined to the expulsion of the dredged material from several tanks which had been previously filled in the ordinary way. These tanks had a total capacity of 240 cubic yards and required three hours in the filling but only 22 minutes in emptying. The material was transported some distance, and when discharged was forced through a leather hose into an iron pipe on shore, and thence a distance of 150 yards to the place of deposit. The saving by this improved method to the company was the difference between 22 cents per yard of last year, and 6 cents this year, which on 115,000 cubic yards, the amount dredged by the company last year, was quite an item.

The accompanying illustration represents Newton's Hydraulic dredge as it is at work on the filling of Lincoln Park drive, dredging sand, gravel and small boulders from the bottom of the lake, at a depth of 13 to 14 feet below the surface, and transporting the dredged material from 65 to 70 feet *outside* of the breakwater to 40 *inside*. The peculiar application of power in this novel dredge was described in the NEWS of April 22d. A further description of the machine is as follows:

The sides and one end of the hull are perpendicular, flat bottom scow bow, 63 feet in length on deck, 24 feet in width, 7 feet depth and draws 3 feet of water when at work on an even keel with three days fuel on board. The boiler and force pump are below deck, with vacuum cylinders at the perpendicular end of the boat, on each side of a well 6 feet wide, which extends 24 feet into the hull and within which the suction pipe to the vacuum cylinders is raised or lowered, rotated and extended to the *bottom* of the deposit to be dredged. The boiler is a locomotive pattern, and has heating surface to evaporate 80 cubic feet of water per hour, to produce 80 lb. pressure of steam.

The vacuum cylinders are each of them 75 cubic feet contents, and a Worthington Duplex force pump, which has a capacity to discharge 400 gallons per minute with an initial velocity due to a pressure of 130 lbs. per square inch, is used. The vacuum cylinders are connected across the well by a T pipe and with a telescopic suction pipe 27 feet in length and 20 inches in diameter, which extends to the work in 17 feet depth of water. The discharge pipe is 15 inches in diameter and extends from the bottom of each cylinder to the end of the boat where it is jointed; the jointed section extends 40 feet beyond the boat and deposits the dredged material at right angles to the boat, or astern, and is supported by guys from the top of a mast, and swings as the the boom of a vessel. This section may be extended 60 or 80 feet.

The vacuum cylinders work by condensed steam, and operate as pumps, to raise the excavated material suspended in the volume of water, to 12 feet above the surface of the water, from the required depth, and discharge by gravity, or by steam pressure, filling and discharging from 9 to 10 times per minute, and conveying *from 500 to 650 cubic feet of water and suspended material per minute, which has from 30 to 40 per cent. of the whole volume of measured material.*

The operation of dredging is performed by the suction pipe excavating its way through the deposit by the discharging jets from the force pump until it is perpendicular and at the depth required, with its mouth-piece open at right angles to the line of the pipe outside of the boat, the jets from the force pump discharging in front, from each side and underneath the lip of the mouth piece, thus undermining the deposit from a face at the required depth, while the suction pipe is swept around against the face of the deposit on the arc of a circle, with the spud anchored from the opposite end of the boat for a center. While so moored against the face the pipe is partially rotated on the T pipe, bringing the suction pipe, mouth piece, and the discharging jets in direct contact with the material by pressure and attri-

tion. The discharge of the force pumps should have an initial velocity of 100 feet per second, and the velocity through the suction pipe from 32 to 40 feet per second.

The results obtained already warrant the value claimed for this form of dredge, and the amount of work which may be done will depend upon the boiler power and size of force pumps applied to produce the two hydraulic currents in combination. There are many minor details that assist in securing the result obtained by the application of these hydraulic principles.

We recently witnessed the working of this machine and by a few simple experiments and calculations verified for ourselves the correctness of the claims of its patentee as to its efficiency and economy. It was working in sand, gravel and small boulders, and while working under several disadvantages and at less than ordinary pressure, was conveying not less than 400 cubic yards per hour from the bottom of the lake to a distance of 30 or 40 feet inside the breakwater. Four men at $2.00 each, per day, are all the crew required, and the consumption of fuel amounts to 2½ or 3 tons, at $6 on board, per day. There is no doubt that the dredge will load a dumpscow of 240 cubic yards capacity easily in less than 30 minutes.

The patentee of this dredge claims for it, in excavating clay, alluvium or other material, an efficiency proportionate to its working in sand, and we hope before long to see it put to the test of actual measurement. The dredge now at work was built at the Vulcan Iron Works in this city, for O. B. Green, under W. H. Newton's patents of Sept. 25th, 1875, Jan. 25th, 1876 and April 4th, 1876 and is designed for the navigation of Lake Michigan in any ordinary weather. Its cost is a little less than $10,000.

In comparing the working of the various dredges we find that the common "Dipper" dredge will excavate from 400 to 500 cubic yards per day of 10 hours; the "Clam-shell," 800 to 2400 cubic yards per day, although the latter amount is very rarely accomplished; while from the well known treatise in "Canal and River Engineering" by David Stevenson, C. E., issued in 1872, we learn that the most pow erful Clyde built elevator machine costing $89,000, in 2420 working hours lifted 430,240 cubic yards of silt and sand, or about 178 cubic yards per hour at a cost of 5.4 cents per yard which was deposited at a distance of 27 miles for about 11 cents per yard. Another dredge working 183¾ hours, raised 122·664 cubic yards of sand, silt and sewage from Glasgow harbor, or at the rate of about 67 cubic yards per hour, at a cost of about 11½ cents per yard for excavation, and almost 33 cents for depositing on land.

We have seen that Duckham's pneumatic dredge raises only 80 cubic yards per hour or 800 per day; while in the dredging operations at Lake Fucino, in Italy, where a very powerful and expensive machine was employed, the effective work per day of 10 hours was 1330 cubic yards which was deposited on the bank along side the canals that were excavated. If better work has been done anywhere in the world than the examples we have given, we would like to hear of them; in the meantime we think we are free to claim for Mr. Newton's dredge the superiority over all others for economy, and simplicity in construction and working, and for efficiency and capacity in the excavation and transportation of material.

Contractors' Intelligence.

Saml. I. Pope & Co., of this city, have received the contract for furnishing the boilers for the Kansas State Penitentiary building, at Lansing, Kansas, at the price of $2,752.

The contract for building the new Tarrant Co. court house, at Fort Worth, Texas, designed by J. H. Ryan, C. E., of Fort Worth, has been awarded to Messrs. Thomas & Warner, of Dallas, Texas, for the sum of $55,000.

The Ruttan Heating and Ventilating Company, of Bloomington, Ill., have recently been awarded contracts for furnishing the heating and ventilating apparatus for public school buildings at Morris, Ill., Grand Rapids, Ohio, Beloit, Wis., and Marshalltown, Iowa.

The contractor for the grading on the Texas & Pacific R. R., west from Eagle Ford, Texas, the present terminus of the road, has been let to the Messrs. Roche Bros., who have just completed their contract of eleven miles east from Fort Worth. The iron, bridge material, etc., have been purchased to complete this extension, which will be pushed forward as rapidly as possible.

PROPOSALS FOR CONTRACTS.

BRIDGE—Proposals will be received at the Auditor's office, in Bryan, Ohio, until 12 o'clock M., June 7th, for the superstruction of a Howe Truss, or Smith Patent Pine Bridge, (high double truss) across the St. Joseph River at West Buffalo, 110 ft. clear span, 120 feet extreme length, 16 feet roadway. Bids for superstructure of bridge to be per lineal foot measuring the lower chord. Said bridge to be set on pile abutments, two rows of five piles each, at each end of the bridge, also, four 16 foot wings four piles to each wing. The timber for pile work to be young, thrifty white oak. Contractors to furnish their own plans and specifications for bridge. Plans and specifications for pile work can be seen at the Auditor's office in Bryan. By order of the Commissioners. J. Kelley, County Auditor.

BRIDGE—Proposals will be received at the office of the Co. Commissioners, in the city of Wilkes-Barre, Pa., until 2 o'clock P. M., Thursday, June 1st, for building a wooded or iron bridge over northeast or south branch of Tunkhannock Creek, in Scott township, on road leading from Benton to Scranion. near Gardner's school house. Said bridge will be built under the provisions of Act of Assembly, approved April 16, 1870, and subject to the report of the Grand Jury, which determines the amount proper to be expended by the county on said bridge, at the sum of $850, the balance of the cost of superstucture and abutments will be paid by the township of Scott. Plans and specifications for said bridge may be seen at the Commissioners' office, when the letting will take place, or bidders may accompany their bids with plans and specifications of such bridges as they know to be durable and economical; Proposals must be sealed and indorsed "Proposals for building a bridge over the northeast branch of Tunkhannock Creek." N. N. Dean, Samuel Line, Peter Jennings.

COURT HOUSE AND JAIL—Proposals will be received by the Board of Co. Commissioners, at the office of the County Clerk until Thursday, June 15th, 1 P. M., for the building of a court house and jail, in Ford Co., Kansas. Said court house to be built of brick, 19 inch walls, 36 feet sqnare and 24 feet high. Each bid must be accompanied with security, by bond of $2,000, conditioned for compliance with bid, if accepted. Plans and specifications can be seen at this office. Address, W. F. Sweeney, Clerk, Dodge City, Kan.

DREDGING—Bids will be received at the office of the Harbor Board, Baltimore, until noon, May 30, and opened immediately thereafter, for the excavation and removal of material from the inner harbor or basin of Baltimore. The right is reserved by the board to reject any or all proposals, and none will be entertained for less than 50,000 cubic yards, or more than 200,000 cubic yards. Specifications and any other information can be had by application to the office of the Harbor Board, City Hall, Baltimore, on and after May 16; By order of the Board. N. H. Button, Engineer.

DREDGING—Bids will be received at the City Engineer's office, Providence, R. I., until Saturday, June 10th, at 12 M., for removing 250,000 cubic yards (more or less) of earth from the Cove Basin. Bidders will state price per cubic yard for excavating and removing, the earth to be at the disposal of the contractor. Further information may be obtained by addressing Chas. E. Paine, City Engineer, No. 17 FourthMain street. Proposals properly endorsed should be addressed to Henry C, Clark, Chairman of Committee.

HEATING APPARATUS—Bids will be received until 12 M. June 15th, for heating the buildings of the Institution for the Deaf and Dumb, at Council Bluffs, Ia. Bidders will furnish their own specifications; but printed directions will be furnished them on application to Wm. Ward, Supt., Council Bluffs, Iowa. By order of the Board of Trustees. Thos. Officer, President.

HOSPITAL BUILDING—Proposals will be received at the Dayton Hospital for the Insane, at Dayton, O., until 12 M. June 7th for taking down a part of the old laundry building, and for performing all the labor and providing all the materials necessary to the erection and completion of an addition to the laundry building at said hospital: and a contract based on said sealed proposals will be made. No proposal will be considered by the trustees of said hospital unless accompanied with a bond of the proposers, with sufficient security in the sum of $2,000, conditional according to law. See acts of 1873, page 103, section 4. Plans and specifications for said building can be seen at the office of said hospital; also, at the office of the Auditor of State, at Columbus, Ohio, at all business hours from this date until the awarding of the contract. A. G. McBurney, W. J. Conklin, W. H. Manning, O. M. Godfrey, Trustees of Dayton Hospital for Insane.

PUMPING ENGINES.—The Board of Water Commissioners of the city of Springfield, Illinois, will receive proposals until 1 o'clock P. M., on the 7th day of June, A. D. 1876, for entering into a contract or contracts at a definite sum or price for supplying the said Board with a Worthington Duplex High Pressure Pumping Engine, with steam cylinders 21½ inches each in diameter, plunger of 17 inches in diameter, with 36 inch stroke, to deliver five million gallons of water in twenty-four hours. Also for one small Duplex Boiler Feed Pump, steam cylinder 6 inches, with plunger of 3½ inches by 6 inch stroke. The above to be delivered and set up at the Springfield Water Works on the foundation to be prapared by the said Board thereat, complete and ready for use in the shortest possible time, or not exceeding ninety days. H. O. Bolles, C. A. Helmle, Geo. Witney, Commissioners.

RAILROAD WORK.—Sealed proposals will be received at the office of the Company at St. George, New Brunswick, until Tuesday, May 30th, 1876, at noon, for the grading and masonry of the Western Division of the Grand Southern Railway. Profiles and specifications can be seen at the office in St. George. J. N. Greene, Chief Engineer.

ROOF AND CORNICE WORK—Proposals, addressed to the undersigned, will be received at the office of the Washington Aqueduct in Washington,, D. C. until 12 M., June 12, for constructing an iron truss roof and galvanized iron cornice on the Gate House at Great Falls. Plans and specifications can be seen at this office, and all necessary information can be obtained from O. E. Babcock, Col. of Engnrs., U. S. A., Chief Engr. Washington Aqueduct.

SCHOOL HOUSE—Proposals for building a school house at Whitehouse, Lucas Co., O., will be received by the clerk of the board up to 12 M., June 12th. Drawings and specifications for same are on file at the office of said clerk in Whitehouse and at the office of Gibbs & Moser, architects, Toledo, O. By order of the Board of Education. F. A. Butler, Chairman. J. L. Pray Clerk.

SEWER PIPE—Proposals will be received by the undersigned at the Village Hall, Hyde Park, until Tuesday, May 30, 3:30 P. M., for furnishing materials and construction of a vitrified tile pipe sewer on the west roadway of Drexel Boulevard, from 43d street, northwardly for a distance of 1,746 feet, according to plans and specifications on file in the Engineer's Department, Hyde Park. The contractors are to receive payments for the same only out of the special assessment for said improvement when the same is collected. John R. Bensley, President of the Board of Trustees.

SCHOOL HOUSE—Proposals will be received at the office of the Clerk of Bethel Township, Clark Co., Ohio, until 12 M. June 10th, for building a school house in sub-district No. 10, of said township, according to plans and specifications on file in said office. The bid for each kind of material called for by the specifications must be stated separately, and the price of labor must also be stated separately. By order of the Board of Education. H. N. Taylor, Township Clerk, New Carlisle, Ohio.

SCHOOL HOUSE.—Bids will be received at the office of the Clerk of the Board of Education of Springfield township, Summit Co., O., until 12 o'clock M., on Tuesday, May 30th, for building a school house on the lot situated in sub-joint district No. 7 in said township according to plans and specifications on file in said office. The bid for each kind of material called for by the specifications, must be separately stated, and the price of each stated, and the price of labor must also be stated separately. By order of the Board of Education. Thos. J. Gilcrest, Clerk.

STREET IMPROVEMENTS—Proposals will be received at the office of the City Clerk of Wheeling, W. V., until 2 P. M., Thursday, June 1st, for furnishing and laying all crossing stones that may be required for the use of the city of Wheeling during the year 1876. Said curb stones to be of the following dimensions, to-wit: 4 ft. long, 22 ins. wide, and 5 ins. thick; ends square the full length of the stone. Crossing stones to be not less than 5 ft. long, 2 ft. wide, and 10 ins. thick. Proposals to be addressed to the Chairman of the Committee on Streets and Alleys. F. A. Britt, City Clerk.

SCHOOL HOUSE—Proposals will be received by the School Board of the Independent school district of Pella, Ia., until noon June 17th, for the erection of a school house, plans and specifications of which can be seen at the office of C. Rhynsburger, Pella, Iowa. Bids may be made as follows: 1, excavation, draining and grading; 2, stone and brick work of entire foundation; 3, all brick and stone work above foundation; 5, carpenter work on entire building; 5, painting and glazing, also all tin or iron work in and about building including gutters; 6. entire building, covering all above named separate items. Address D. S. Huber or C. Rhynsburger, Pella, Iowa.

STEAM HEATING APPARATUS AND BOILER—Proposals will be received by the Regents of the University of Wisconsin for putting a steam apparatus to heat about 750,000 cubic feet, in their new Science Hall building. Also, separate proposals for furnishing a low pressure steam boiler of 8 feet diameter and 26 feet length. The plans and specifications for both classes of work can be seen in Milwaukee, at the office of H. C. Kock, architect, where any information in relation thereto can be had. Proposals will be received by John S. Dean, Secretary, at Madison: Wis., before June 18th, will be considered, and if satisfactory to the Regents, the work will be contracted for. N. B. Van Slyke, Chairman Building Committee.

SCHOOL HOUSE—Proposals will be received by the Board of Education, District No. 2, Township 38, Cook Co., Ill., for the erection and completion of a public school building to be located on the southeast corner of 51st and School streets, in said district. Bids will be received for the different parts of the work or for the building complete. A good and sufficient bond will be required to accompany each bid. Plans and specifications may be seen at Room 12, 169 E. Madison St., Chicago. Bids will be received at the office of W. Wilkie, Secretary, Englewood, Ill., on or before 12 M., Saturday, June 3d. All bids must be addressed to the Secretary and endorsed, Proposals for the erection of a "Public School Building," Dis. No. 2, Tp. 38, Cook Co., Ill. John Alloway, Samuel Pullman, F. W. Springer, Building Committee.

STATE EDUCATIONAL INSTITUTION.—Proposals for furnishing material and the erection of the main building of the Institution for the Education of the Blind, in the city of Janesville, Wisconsin, according to the plans and specifications thereof, will be received by the undersigned, at his office, No. 6 East Milwaukee Street, Janesville, Wis., until 12 o'clock noon, June 15th 1876. The plans and specifications may be examined at the office of A. Anderson, architect, (under whose supervision the work will be done), at No. 37 West Milwaukee Street, Janesville, from and after June 1st 1876. Proposals may be made separately for mason work, including the cast iron work connected therewith; and for carpenter work, including galvanized and wrought iron work, tin work, painting and glazing. Proposals will also be received for doing the entire work. For further particulars address or call upon the undersigned. J. B. Whiting, Secretary of the Board of Trustees of the Wisconsin Institution for the Education of the Blind.

STATE ROAD—Notice is hereby given that $2,000, to be paid in State Swamp Lands, has been appropriated by the Board of Control to be expended on the west division of the Alpena and Torch Lake State Road, commencing at the Seven Mile Post on section 33. town 31 north, range 8 west, in the township of Central Lake, Antrim County, Mich., and continuing west to said state road survey. The job for constructing said road will be let to the lowest responsible bidder or bidders, on Tuesday, June 6th at P. M. at Wadsworth's store in said township where sealed proposals for doing said work will be received by the undersigned until 10 o'clock A. M. of said day. Payments for said work will be made in State Swamp Lands, according to law. Contract blanks showing how the road must be built, and a diagram and field notes of the survey, can be seen at the residence of the undersigned. James M. Wadsworth, Local Commissioner, Central Lake, Mich.

SCHOOL HOUSE—The Board of Education of Jefferson township, Franklin county, Ohio, hereby invite bids in accordance with section 54, Ohio School Laws, for the building of two school houses in said township, on the sites now occupied for school purposes in sub-districts Nos. 4 and 8. Specifications: Size, 24x32 feet; walls brick, good quality, 13 inches thick, 12 ft. story above foundation; foundation to be of good stone and extend not less than 2½ feet above the surface of the ground, and to be not less than 20 inches thick, with center wall 12 inches thick, well laid in mortar. Each house to have two doors (state price of one) with transom light above, and 3 well proportioned windows on each side of the house in box frames, with pulleys; the finish to be plastering and wainscoting. The wainscoting to be put on after one coat of plastering from the floor to the base of the windows. The walls to have three coats, the last one hard finish. With seats of an approved make and pattern; first-class pine shingles to be used in roofing, with 15 inch cornice; all lumber to be first-class. The old houses are of brick; size of one in sub-district 4, 20x26 feet; in sub-district 8, 20x24 feet, with 8 inch wall, and 9 feet story, on stone foundation. The material in these must be taken into account, and used as far as practicable in the construction of the new houses. Bids will be received at the office of the Township Clerk until June 3d at which time they will be opened. Any other information may be had by applying to E. Dryer, Gahanna, or H. J. Rhodes and J. W. Sagar, Black Lick, committee.

WROUGHT AND CAST IRON WORK—Proposals will be received at the office of the Supervising Architect at the Treasury Department, Washington, D. C, until 12 M. May 30th, for furnishing, delivering, fitting, and putting in place the wrought and cast iron work, comprising columns, pilasters, etc., of second and third stories, and as exhibited on the drawings, described in the specifications, and called for in the schedule. Copies of the drawings, specifications, schedule, and form of proposal, and any additional information, may be had on application to the superintendent of the building, or at this office. Wm. A. Potter, Supervising Architect.

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ORNAMENTAL FOUNTAIN.—Sealed proposals will be received at this office until Thursday, June 1st, 1876, at 10 o'clock A. M., for furnishing and placing in the East Grand Circus Park an Ornamental Fountain, which shall be in every respect equal to the fountain now in the West Grand Circus Park. Bidders will furnish their own designs. Bidders are required to file a satisfactory bond with the Board of Public Works, before the proposals are opened, conditioned that, should they be found to be the lowest bidders, they will enter into a contract, with good and sufficient sureties, to perform the work. Proposals to be indorsed with the names of the parties bidding. Alex. Chapoton, President Board of Public Works, Detroit.

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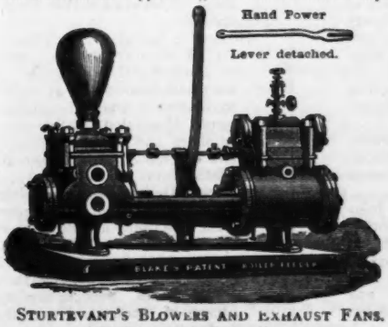

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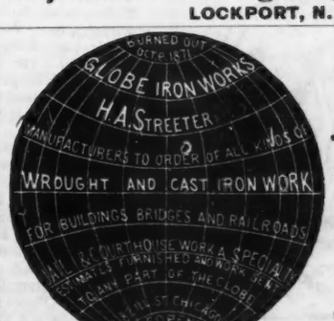
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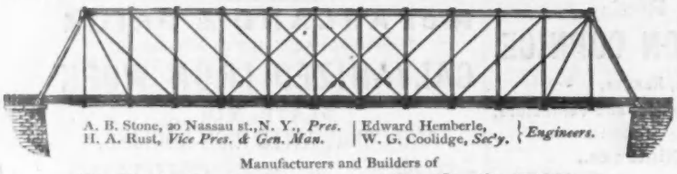

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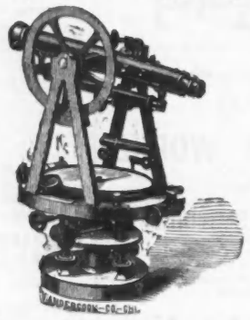

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